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**United States Patent** [19]**Poletti**[11] **Patent Number:** **5,729,613**[45] **Date of Patent:** **Mar. 17, 1998**[54] **REVERBERATORS FOR USE IN WIDE BAND ASSISTED REVERBERATION SYSTEMS**[75] **Inventor:** Mark Poletti, Wellington, New Zealand[73] **Assignee:** Industrial Research Limited, New Zealand[21] **Appl. No.:** 624,547[22] **PCT Filed:** Oct. 17, 1994[86] **PCT No.:** PCT/NZ94/00110

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[51] **Int. Cl.<sup>6</sup>** ..... H03G 3/00[52] **U.S. Cl.** ..... 381/63; 84/630[58] **Field of Search** ..... 381/63, 61, 1; 84/630, DIG. 26, 707[56] **References Cited****U.S. PATENT DOCUMENTS**

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**Primary Examiner**—Curtis Kuntz**Assistant Examiner**—Xu Mei**Attorney, Agent, or Firm**—Woodard, Emhardt, Naughton, Moriarty & McNett[57] **ABSTRACT**

A multi-channel reverberation system has a substantially constant multi-channel power gain at audio frequencies and comprises multiple signal inputs, one for each input channel, a number of comb filter networks connected to each signal input, each comb filter network including a feed forward stage, a cross-coupling network cross-coupling the comb filters to increase the reverberation echo density, and multiple signal outputs, one for each output channel. Preferably the feed forward stage of each comb filter provides a substantially constant multi-channel power gain at audio frequencies and the cross-coupling matrix is an orthogonal cross-coupling matrix cross-coupling a number of single channel allpass comb filters, positioned immediately before or after the delay lines, to create a multi-channel allpass comb filter with a unitary transfer function matrix at all frequencies.

**3 Claims, 4 Drawing Sheets**